Location details correct!
See John De Leen.
Otherwise OK.

A MINERALOGRAPHIC STUDY OF SOME SPECIMENS OF ORE FROM THE KEYSTONE PROPERTY NEAR COLDWATER RIVER BRITISH COLUMBIA

A Report submitted in partial fulfillment
of the requirements of Geology 409, part of
the course leading to the degree of
Bachelor of Arts, at the
University of British Columbia

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Introduction

General Statement

The Keystone property is a lead-zinc deposit, recently staked in the Coldwater River area.

Location and Topography

The Keystone property is located thirty five miles north-west of Hope, British Columbia and one mile west of the Coldwater River.

The property lies within the Coast Range Mountains, and hence the area is quite rugged with fairly steep slopes, heavily timbered and thick with underbush.

Accessibility and Transport

The property is one mile west of the Canadian Pacific Railway which follows the Coldwater River in this area. There is a trail from the railway to the property.

Previous Work

As far as the writer can ascertain there has been no previous work done on the property. The only source of information regarding the geology of the area available to the author is the Hope Map Area, Map No. 737A, prepared by the Geological Survey of Canada.

General Geology

The Keystone property is located in an area of gneissic granodiorite called the Eagle Granodiorite of Mesozoic and/or Cenozoic age.

Mineralogy

General Statement:

Several polished sections and a few thin sections, taken from the specimens were examined by the author in an effort to establish the mineralogy of the deposit and to determine the paraganetic sequence.

Megascopic Examinations:

Two features of the specimens are very conspicuous, (a) the pyritization of the wall rock, and (b) the banding of the vein.

In general the wall rock is a medium gray-green color and brecciated with pale green fragments. These pale green fragments are predominantly quartz which was probably deposited early in the period of mineralization. The wall rock is extensively pyritized with angular masses up to 5 cm long.

The vein shows prominent crustification banding (Figure 1) with alternate bands of pink and gray gangue minerals interspaced with bands of massive sphalerite and galena, and occasional bands and vugs of quartz. Several of the specimens of the vein material shows a marked concentration of the metallic minerals towards the outsides of the veins, while the center portions consisted mainly of gangue minerals. The bands of gangue minerals, especially the pink mineral seems to be guided to some degree, in their banding by isolated grains of the metallic minerals, and they curve around these grains with the convex side of the band towards the center of the vein.

The sphalerite is a pale yellow-brown color which indicates that it has a low iron content. A soft gray metallic mineral was found coating one area of the pink gangue mineral. Some of the specimens are flecked with a soft pale yellow secondary mineral.

Microscopic Examination

1. Sphalerite (ZnS) The sphalerite occurs as stringers up to 6.03 mm long and .79 mm wide concentricly banded with the gangue minerals, and as isolated sub angular grains 1.8 mm x .65 mm in size, disseminated in the gangue minerals. Small triangular to angular grains of chalcopyrite occur in the sphalerite (Figure 2). These grains of chalcopyrite have some orientation and may be due to ex-solution.

A spectrographic analysis of the sphalerite was made and the following results obtained:

+ 1%	0.1-1%	0.1%	not detected
Major	Minor	Trace	An
Zn	cd	Sn	Ge
Pb	cu	Ir	Hs
	Fe	Ag	Bi
		Mn	Bc
		Sn	Co
			Ni
			Mo
			Ti

The presence pf Pb in the analysis is probably due to microscopic inclusions of galena in the sphalerite. The analysis shows that the sphalerite has a low iron content. This factor makes the ore more valuable for it reduces the cost of milling. ?
The sphalerite composes up to 45 per cent of the metallic minerals in the vein.

<u>Galena</u> (PbS) Galena occurs as angular grains from 104 μ x 262 μ up to 1.31 x .65 mm in size disseminated throughout the sections. The galena is closely associated with the tetrahedrite (Figure 3) and also contains a few angular grains of chalcopyrite. The galena comprises about 35 per cent of the metallic minerals in the vein.

<u>Tetrahedrite</u> ($5Cu_2S \cdot 2(Cu,Fe)S \cdot 2Sb_2S_3 + Ag$) Tetrahedrite occurs as rounded to subangular grains up to .56 x 1.58 mm in size disseminated

throughout the sections. In every case it is closely associated with galena and exhibits some suggestion of caries texture (Figure 3). The tetrahedrite also occurs as small thin grains coating a small area of pink rhodochrosite. The identification of the mineral was checked from its X-ray diffraction pattern. The tetrahedrite comprises up to 25 per cent of the metallic minerals in the vein.

<u>Chalcopyrite</u> ($CuFeS_2$) Chalcopyrite occurs as small triangular and angular grains 6 x 39 α in size sparsely disseminated in the sphalerite and galena. When it is contained in the sphalerite it generally has some orientation and is probably due to ex-solution. However, when it is contained in the galena there is no suggestion of orientation. The chalcopyrite comprises up to 2 per cent of the metallic minerals found in the vein.

<u>Pyrite</u> (FeS) Pyrite occurs as angular fragments sparsely disseminated throughout the sections taken from the vein and as angular masses 5 cm long comprising up to 70 per cent of the sections taken from the wall rock. This great increase in the percentage of pyrite from the vein to the wall rock indicates that the pyrite is generally earlier in the paragenetic sequence than the main minerals of the vein. In one section studied, the pyrite, mixed with and filling fractures in quartz comprises the outermost band of the vein. (Figure 4).

In an effort to determine if the pyrite contained gold the following procedure was undertaken. (1) A sample of pyrite was crushed and size screened. (2) The fraction -60+80 was superpanned and the heavy tip collected. (3) This heavy tip was mounted in bakelite and given a high polish. Using a high powered microscope (x1160) the author could find no trace of gold in the selected pyrite.

Gangue Minerals

<u>Rhodochrosite</u> ($MnCO_3$) The rhodochrosite exhibits two distinct varieties (a) a pink variety, and (b) a light gray variety. By their X-ray diffraction pattern it was found that the pink variety is ordinary rhodochrosite (Figure 5), while the light gray variety is a mixture of rhodochrosite and quartz (Figure 6). The mineral occurs as crustification banding' (Figure 7), in the vein. The rhodochrosite was deposited alternately with the metallic minerals and quartz and was possibly the last mineral to be deposited because it generally fills the central portions of the vein.

<u>Quartz</u> (SiO_2) Quartz occurs as bands in the vein and as crystals up to 1/32 cm long filling vugs in the rhodochrosite. Some of the bands show comb structure.

From the examination of the sections it is evident that there are two generations of quartz. (1) A pre pyritization period, and (2) alternate deposition with the rhodochrosite.

Secondary Minerals

Talc. Talc occurs as soft yellow grains coating some of the specimens. Its identification was checked from its X-ray diffraction pattern.

Wallrock Alteration

The wallrock of the vein has been very extensively chloritized and altered to kaolin. These alteration products, which give the rock its green color, is very crumbly and easily dissolved in water. The only samples of the wallrock available to the author were within six inches of the vein. These samples are too badly altered and brecciated to make any reasonable statement as to the original composition of the rock, other than it was of a granitic nature. It may be part of the Eagle granodiorite.

Temperature of Deposition

The metallic minerals, sûch as sphalerite, galena, and tetrahedrite, indicate that this deposit can be classed as a mesothermal deposit. However, the presence of gangue minerals such as rhodochrosite, and the presence of much crustification banding, and vugs, indicate an epithermal deposit.It seems possible, therefore, that this deposit formed in a temperature range of 200 to 350 C.

Paragenetic Sequence

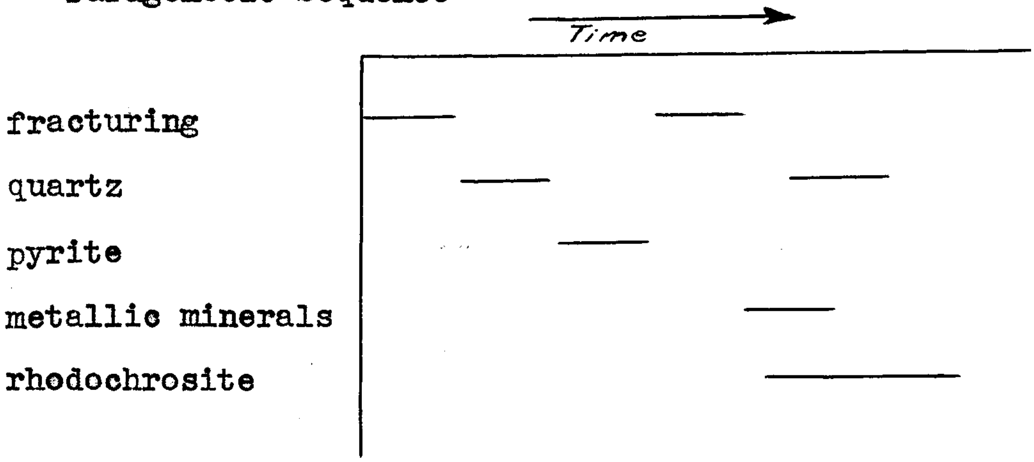

Figure I Section of vein showing crustification banding (B), X1

Figure 2 Orientated inclusions of chalcopyrite (yellow) in sphalerite (white), galena (red), gangue (green) X 105

Figure I

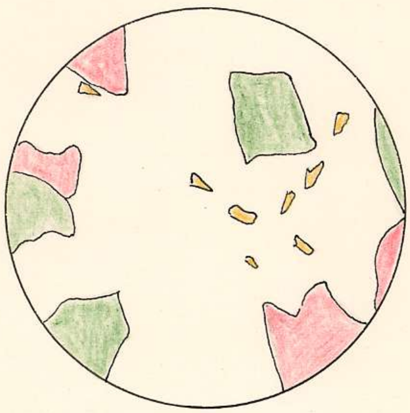

Figure 2

Figure 3 Tetrahedrite(blue) associated with galena (red), and gangue (green) X60

Figure 4 Pyrite (orange) veining quartz (white) X5 .

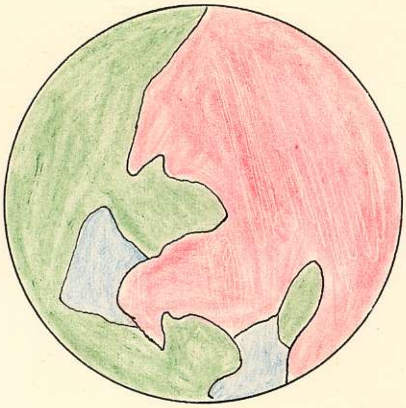

Figure 3

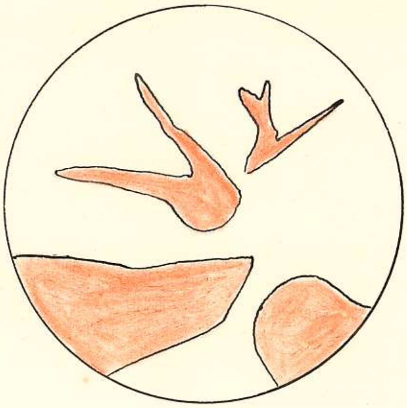

Figure 4

Figure 5 X-ray diffraction pattern of pink rhodochrosite XI

Figure 6 X-ray diffraction pattern of gray rhodochrosite, a mixture of quartz and rhodochrosite XI

Figure 7 Crustification banding of rhodochrosite X2

Figure 5

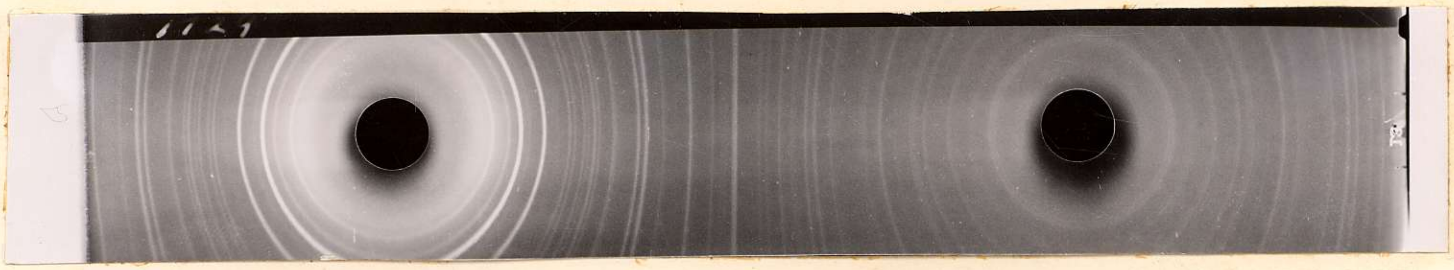

Figure 6

Figure 7